A **vector space** is a nonempty set V of objects, called vectors, with the operations of addition and scalar multiplication by real numbers that satisfy, for all $\mathbf{u}$, $\mathbf{v}$ and $\mathbf{w}$ in V and scalars c and d the following ten properties:

1. Closure under addition:

2. Addition is commutative:

3. Addition is associative:

4. There is a zero vector:

5. Existence of Additive inverses:

Scalar properties:

6. Closure under scalar multiplication:

7. Scalars distribute:

8. Scalars distribute:

9. Scalar multiplication is associative:

10. Scalars have multiplicative identity:

Examples

A **subspace** of a vector space V is a subset H of V satisfying

1.

2.

3.